# Executive Summary

In August of 2000, CH2M HILL was retained by the California Department of Transportation (Caltrans) to prepare a planning and feasibility report to add bicycle/pedestrian/maintenance pathway(s) to the existing west spans of the San Francisco—Oakland Bay Bridge (SFOBB). The findings of this study were presented to the Metropolitan Transportation Commission (MTC) for use in determining funding and implementation strategies. **The study has determined that it is feasible to add a bicycle/pedestrian/maintenance path to the existing west spans of the SFOBB structure, connecting the East Bay from Yerba Buena Island (YBI) to San Francisco.** A summary of the findings is given below.

The feasibility study considers two pathway corridors: one with pathways along both sides of the upper deck cantilevered out from the existing stiffening trusses, and another with a single pathway along the upper deck cantilevered out from the existing northside stiffening truss. Prior to this feasibility study, Caltrans, MTC, and representatives from the Bay Bridge Bicycle and Pedestrian Advisory Committee (BBBPAC) met to reduce the number of potential pathway corridors to be considered in this study. The pathway corridors eliminated from further study included:

1. **Pathway(s) along the lower deck of the existing bridge.** This option was discarded due to restricted views, noise, and air quality concerns when compared to locating the pathway corridor along the upper deck of the existing bridge.
2. **Pathway hung below the lower deck of the existing bridge.** Although this corridor would offer panoramic views of the area and minimize user exposure to vehicular noise and air pollution, it would create major structural conflicts with the existing tower members and pier anchorages. Also, the pathway would reduce the current shipping channel's vertical clearance envelope. Economic feasibility of this corridor was deemed very low.
3. **Pathway suspended above the upper deck of the existing bridge between towers.** This corridor would offer panoramic views of the area and minimize user exposure to vehicular noise and air pollution. However, it was discarded due to traffic impacts and associated construction costs. Economic feasibility of this corridor was deemed very low.

Initially, 16 different subalternatives were considered for the two upper-deck corridor schemes: twin pathways outside the main stiffening truss on the north and south sides of the SFOBB, and a pathway outside the main stiffening truss on the north side only. The proposed twin pathways would each be 12 feet wide between rails; the single pathway would be 15.5 feet wide between rails. A group of seasoned bridge engineers and architects short-listed these 16 subalternatives, selecting two design concepts that locate pathways on the outside of the north and south sides of the stiffening truss for future development in the study. The single, 15.5-foot-wide pathway along the north side was eliminated from further study for architectural, practical, and engineering reasons.

Selection of these alternatives was driven by several key constraints:

**Mitigating existing shipping channel vertical clearances and reducing or removing dead load imposed by the addition of a pathway on the structure's stiffening trusses.** A major constraint on the project's economic feasibility is mitigating existing shipping channel vertical clearances. The U.S. Coast Guard will not permit a reduction in the existing vertical clearance between the lower chord of the SFOBB stiffening truss and the waterway below. Because suspension bridges are very flexible, large vertical deflections are associated with construction loads, dead loads, wind loads, live loads, thermal changes, and seismic loads. Any additional dead load imposed on the stiffening trusses by a pathway will result in further deflections; therefore, alternatives that add minimal dead load or remove dead load are preferable.

**Addressing Section 106 requirements to minimize adverse impacts to the "character-defining" elements of the SFOBB, which is considered a historic property.** The SFOBB qualifies for listing in the National Register of Historic Places; as such, the National Historic Preservation Act (NHPA) requires, in Section 106, a study for new work on the bridge. This study takes into consideration potential effects of a proposed project on the historic property and, as a result, generates criteria for architectural design that seek to minimize adverse impacts to the structure's "character-defining" elements.[1]

To mitigate the vertical deflection restriction of the superstructure, Alternative No. 1 replaces the lower deck of the existing roadway with a lighter-weight steel orthotropic deck. Without this mitigation, the bridge would deflect 21 inches due to the pathway weight. This concept is referred to as the Deck Replacement Scheme. To address Section 106 requirements, Alternative No. 1's design concept does not "*radically change, obscure, or destroy the character-defining spaces (solids and voids), materials, features, or finishes.*"[2] This involves recreating the vocabulary that is visible on the bridge and cantilevering the new pathways on either side of the upper deck. More specifically, the profile of the leading edge of the new deck mimics the existing structure through lateral extension of the 39-inch-deep upper chord of the stiffening truss.

Alternative No. 2 design concept, referred to as the Lightweight Scheme, is based on creating a lighter pathway and underlying structure compared to Alternative No. 1. It uses the most lightweight steel framing system possible and lifts the superstructure by shimming or lifting the stiffening truss higher on vertical suspenders to mitigate the vertical deflection of the superstructure. Without this mitigation, the bridge would deflect 13 inches due to the pathway weight. To address Section 106, the concept will "*… be designed and constructed to be clearly differentiated …*" from the historic structure.[3] This scheme is identified by state-of-the-art architectural vocabulary, which demonstrates current technology and design, and includes tapered support elements and angled steel cable railings.

Key features of the twin pathway alternatives, along with associated estimated construction costs and schedules, are summarized in Table 1. **(Note: All costs are reported as present day, 2001, costs. Capital costs include construction, right-of-way, project development, and**

[1] U.S. Department of the Interior, *Secretary of the Interior's Standards for Rehabilitation*, U.S. Government Printing Office, 1990.
[2] Ibid.
[3] Ibid.

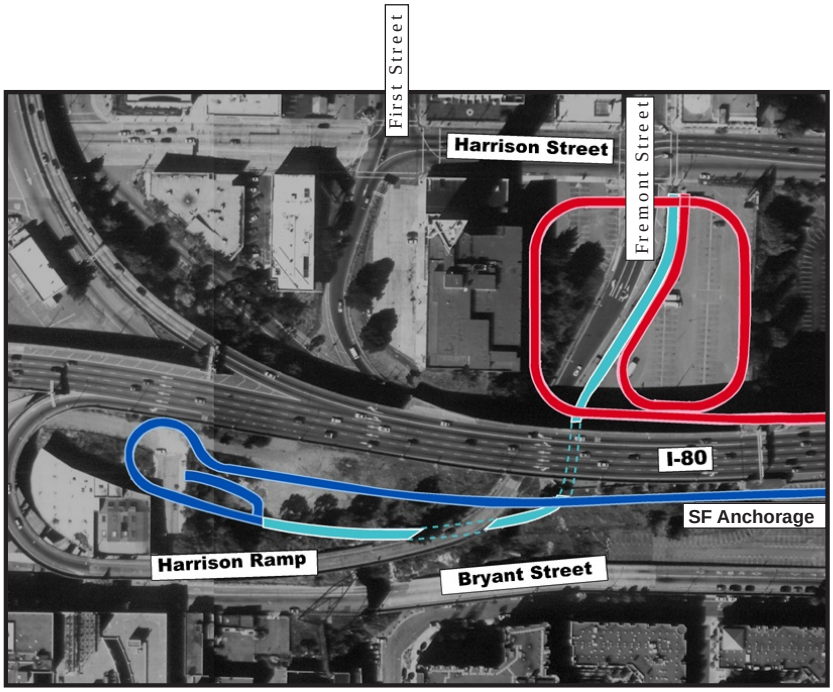
**construction management.)** The study also evaluated the lifetime maintenance and security costs of the facility over a 75-year period, which totaled $59.6 million for either alternative.

Figures 1A, 1B, and 1C at the end of this section show aerial views of the proposed pathway, with descriptions of key features along the pathway within the City of San Francisco, on the SFOBB, and on YBI.

**TABLE 1**
Key Features of Selected Twin Pathway Alternatives

|  Key Pathway Features |  Alternative No. 1, Deck Replacement Scheme |  Alternative No. 2, Lightweight Scheme |
|---|---|---|
| **Pathway Length on Grade** | 2,726 feet | 2,726 feet |
| **Elevated Pathway Length** | 25,009 feet | 25,009 feet |
| **Total Length** | 27,735 feet | 27,735 feet |
| **Typical Width** | 12 feet | 12 feet |
| **Mitigation for Shipping Channel Vertical Clearance*** | Replace lower roadway deck with lighter steel orthotropic deck system. Cost at $223.6 million | Lift stiffening truss by shimming vertical suspender cables. Cost at $10.2 million |
| **Construction Period**** | 35 months | 34 months |
| **SFO Segment—Capital Costs** | $21.4 million | $21.4 million |
| **SFOBB Segment—Capital Costs** | $340.4 million | $114.0 million |
| **YBI Segment—Capital Costs** | $25.0 million | $25.0 million |
| **Total Capital Cost** | $386.8 million | $160.4 million |

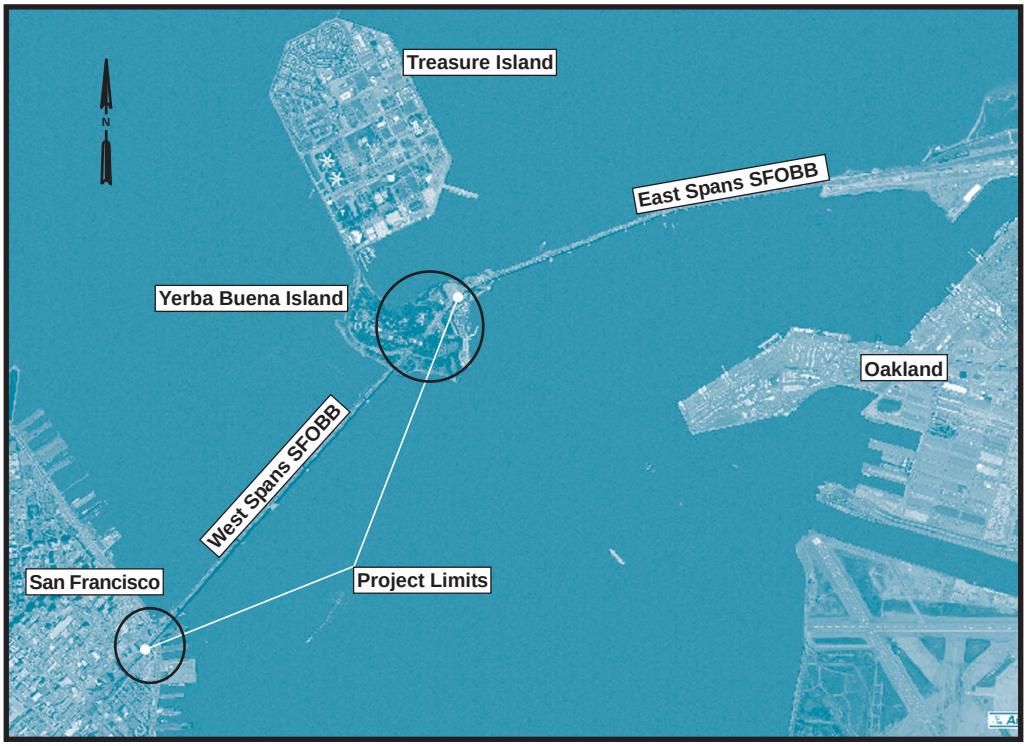
*Mitigation cost is included in the SFOBB segment's capital costs.
**Construction periods would be 12 months less if the U.S. Coast Guard waives mitigation for shipping channel vertical clearance.




Alignment Within San Francisco

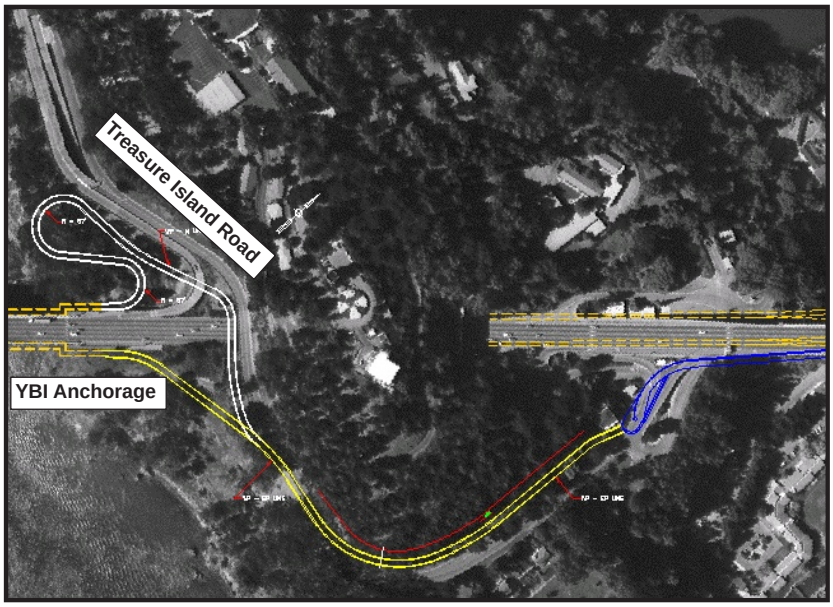
- Pathways 12 feet wide on north and south side, connecting at-grade near Harrison and Fremont Streets
- Pathways terminate into a plaza area with access to downtown San Francisco, the Transbay Terminal, and the Embarcadero
- Pathways meet requirements of Americans With Disabilities Act

Figure 1A
**Pathway Description**




- Pathways 12 feet wide on north and south side of SFOBB
- Pathways located at the upper-deck level
- Between Piers W1 and W2, the pathways are widened to 15.5 feet to act as a continuous belvedere
- Belvederes are provided at Piers W3, W5, and W6
- Elevators are provided at Pier W1
- Pathways meet requirements of Americans With Disabilities Act

Figure 1B
**Pathway Description**




Alignment on YBI

- Pathways 12 feet wide on north and south side, connecting at Treasure Island Road
- Single pathway 15.5 feet wide along Treasure Island Road
- Pathway continues to proposed SFOBB East Span Replacement project
- Pathways meet requirements of American With Disabilities Act

Figure 1C
**Pathway Description**